

contacting a surface to which fluid is to be dispensed for spacing the outlet of the tip from the surface.

16. A dispensing tip according to claim 9, wherein the body has a longitudinal axis, the converging portion of the passage being a first passage portion, there being a second passage portion extending between the first passage portion and the outlet, the first and second passage portions extending along the axis and wherein the diameter of a drop of fluid leaving the outlet is directly proportional to the ratio of the axial length of the second passage portion to the axial length of the first passage portion.

Remarks

The Abstract has been shortened in response to paragraph 5 of the Office Action. The informalities in claims 6 and 8 noted in paragraph 6 of the Office Action have been corrected.

Reconsideration of the rejection of claim 1 under 35 USC 102 in view of Tomasello is respectfully requested for the following reasons. In the precision dispensing of small amounts of viscous material it is important to provide consistent shapes of the material applied to a series of locations on a surface and to do so at a relatively fast rate of travel from location to location. Applicant's claimed invention provides a nozzle or tip for use in precision dispensing systems which provides a continuous, uninterrupted flow of fluid therethrough. In the precision dispensing of small quantities of fluid, for example viscous materials such as adhesive on circuit boards, it is also

important to maintain consistency in the size and shape of the dots of material applied to the surface. Coupled with this requirement is the need to place the dots on the surface as quickly and accurately as possible. Any trailing of material from the outlet of the nozzle or tip which could result in tear drop shaped dots needs to be avoided.

All the foregoing requirements and objectives dictate a continuous, uninterrupted flow of material through the nozzle or tip. The material should flow through the tip in a manner avoiding introduction of turbulence to the fluid flow. This is accomplished by shaping the interior passage of the tip in accordance with the applicant's claimed invention. The material is funnelled smoothly and continuously along passage portion 22 shown in Fig. 3 of the instant application and the uninterrupted nature of the flow is enhanced by the gradual convergence of passage portion. The smooth transition between portions 22 and 26 avoids introduction of turbulence and any other flow interruptions or irregularities. The constant diameter or cylindrical shape of passage portion 26 contributes to forming or shaping the ball of material leaving outlet 16 as well as to maintaining the consistency of the shape of the material as it is discharged.

As pointed out in the instant application, the dot size is defined as the diameter of the hemispherically shaped dot of material exiting the outlet 16. In addition, in the dispensing tip of applicant's invention, if D (diameter of inlet 14), L (overall length of tip) and d (diameter of outlet 16) are held constant, the exit dot size is directly proportional to the

ratio of x (length of passage portion 26) to l (length of passage portion 22). Thus, in the dispensing tip of applicant's invention, the size of the drop of material leaving the outlet 16 can be influenced by a change in the lengths of either or both the passage portions 22 and 26.

The Tomasello nozzle delivers high volume air flow, not controlled amounts of viscous fluid to a selected location as claimed by applicant. This aspect of applicant's claimed invention should be given patentable weight in differentiating over the prior art Tomasello apparatus by virtue of the structural relationship in part d) of amended claim 1 being linked by its effect on the size of the drop of viscous fluid leaving the dispensing tip outlet to the delivering controlled amounts of viscous fluid to a selected location recited earlier in amended claim 1. Furthermore, the subject matter of part d) of amended claim 1 is not disclosed or suggested by Tomasello because drops of viscous fluid do not leave the outlet of the Tomasello nozzle.

The significant distinctions of applicant's claimed invention defined in amended claim 1 together with the important advantages of applicant's claimed invention arising from those distinctions weigh heavily against any obviousness. Accordingly, amended claim 1 is believed to patentably distinguish over Tomasello within the meaning of 35 USC 102 and 35 USC 103.

Reconsideration of the rejection of claims 1 and 8 under 35 USC 102 based on Ritsky et al is respectfully requested for the

following reasons. The annular step 32 between passage portions 24 and 12 in the Ritsky et al nozzle would introduce turbulence and other flow interruptions or irregularities which the dispensing tip of applicant's invention seeks to avoid. Thus the Ritsky et al nozzle passage does not conduct fluid from inlet to outlet in a continuous and uninterrupted manner in contrast to applicant's claimed dispensing tip. Amended claim 1 also patentably distinguishes over Ritsky et al for the same reasons given herein with respect to Tomasello.

The significant distinctions of applicant's claimed invention defined in amended claim 1 together with the important advantages of applicant's claimed invention arising from those distinctions weigh heavily against any obviousness. Accordingly, amended claim 1 is believed to patentably distinguish over Ritsky et al within the meaning of 35 USC 102 and 35 USC 103.

Reconsideration of the rejection of claims 1, 3-5 and 9-11 under 35 USC 102 based on Richter et al is respectfully requested for the following reasons. In the Richter et al nozzle, the converging passage portion B is spaced a considerable distance from the inlet by the constant diameter passage portion A. Claims 1 and 9 are amended to call for a passage portion converging in a direction immediately from the inlet thereby patentably distinguishing over Richter et al. This immediate converging is important to insure the continuous and uninterrupted flow called for in claims 1 and 9. Claim 1 is believed to patentably distinguish further over Richter et al for the same reasons given herein with respect to Tomasello.

The significant distinctions of applicant's claimed invention defined in amended claims 1 and 9 together with the important advantages of applicant's claimed invention arising from those distinctions weigh heavily against any obviousness. Accordingly, claim 1 as amended, dependent claims 3-5, claim 9 as amended and dependent claims 10 and 11 are believed to patentably distinguish over Richter et al within the meaning of 35 USC 102 and 35 USC 103.

Reconsideration of the rejection of claims 6 and 7 under 35 USC 103 based on Heron et al in view of Vickers is respectfully requested for the following reasons. The Heron et al patent makes clear that the entire structure of Fig. 1 is a nozzle, i.e. a dispensing tip. Therefore, the inlet is at the left-hand end of the structure shown in Fig. 1. The converging section is spaced a considerable distance from the inlet. As a result, claims 6 and 7 are believed to patentably distinguish over Heron et al for the same reasons amended claim 1 is believed to patentably distinguish over Richter et al. Also, Heron et al do not disclose or suggest the subject matter in part d) of amended claim 1. Accordingly, claims 6 and 7 are believed to patentably distinguish over Heron et al and Vickers within the meaning of 35 USC 103.

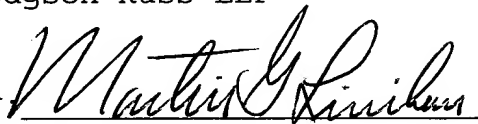
The rejection of claims 2 and 12 under 35 USC 103 based on Richter et al is respectfully traversed. Dependent claims 2 and 12 include all the limitations of amended independent claims 1 and 9, respectively, which for the reasons set forth above are believed to patentably distinguish over Richter et al within the meaning of 35 USC 103.

Replacement claim pages are included herewith.

Favorable action on this application is respectfully
requested.

Respectfully submitted,

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